CLAIMS

What is claimed is:

1. An insulating material for a rocket motor, comprising:
a cured elastomer; and
vapor-grown carbon fibers dispersed in the cured elastomer.

2. The insulating material of claim 1, wherein the vapor-grown carbon fibers comprise an internal graphitized tube surrounded by a sheath of vapor-deposited amorphous carbon.

3. The insulating material of claim 1, wherein the vapor-grown carbon fibers have an average diameter from about 0.1 micron to about 0.8 micron.

4. The insulating material of claim 3, wherein the average diameter of the vapor-grown carbon fibers is about 0.2 micron.

5. The insulating material of claim 1, wherein the vapor-grown carbon fibers have an average length from about 50 microns to about 200 microns.

6. The insulating material of claim 1, wherein the vapor-grown carbon fibers comprise not more than 30 weight percent of a total weight of the insulation.

7. The insulating material of claim 6, wherein the vapor-grown carbon fibers comprise at least 10 weight percent of the total weight of the insulation.

8. The insulating material of claim 1, wherein the cured elastomer is formed from a precursor composition comprising at least one crosslinkable polymer.

9. The insulating material of claim 8, wherein the at least one crosslinkable polymer comprises between about 55 weight percent and about 70 weight percent of a total weight of the precursor composition.

10. The insulating material of claim 8, wherein the at least one crosslinkable polymer is selected from the group consisting of EPDM terpolymer, polybutadiene, polyisoprene, poly(acrylonitirle-co-butadiene), and a precursor of natural rubber.

11. The insulating material of claim 8, wherein the precursor composition further comprises a sulfur-containing curative.

12. The insulating material of claim 1, wherein the insulating material is formulated to have a perpendicular and a parallel elongation of greater than 30%, a parallel tensile strength of greater than 1000 psi, and a tear resistance of greater than 170 pli.

13. The insulating material of claim 1, wherein the insulating material is formulated to have a volume resistivity between about 5×10^9 and 5×10^{14} Ohms·cm.

14. A method for making an insulating material for a rocket motor, comprising:
providing a composition comprising at least one crosslinkable polymer and vapor-grown carbon fibers;
dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer; and
crosslinking the at least one crosslinkable polymer to form a cured elastomeric insulating material having the vapor-grown carbon fibers dispersed therein.

15. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer comprises dispersing vapor-grown carbon fibers having an internal graphitized tube surrounded by a sheath of vapor-deposited amorphous carbon in the at least one crosslinkable polymer.

16. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer comprises dispersing vapor-grown carbon fibers having an average diameter of about 0.1 micron to about 0.8 micron in the at least one crosslinkable polymer.

17. The method of claim 15, wherein dispersing vapor-grown carbon fibers having an average diameter of about 0.1 micron to about 0.8 micron in the at least one crosslinkable polymer comprises dispersing vapor-grown carbon fibers having an average diameter of about 0.2 micron in the at least one crosslinkable polymer.

18. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer comprises dispersing vapor-grown carbon fibers having an average length between about 50 microns and about 200 microns in the at least one crosslinkable polymer.

19. The method of claim 14, wherein providing a composition comprising at least one crosslinkable polymer and vapor-grown carbon fibers comprises providing a composition comprising at least one crosslinkable polymer selected from group consisting of EPDM terpolymer, polybutadiene, polyisoprene, poly(acrylonitirle-co-butadiene), and a precursor of natural rubber.

20. The method of claim 14, wherein providing a composition comprising at least one crosslinkable polymer and vapor-grown carbon fibers comprises providing a composition comprising at least one crosslinkable polymer, vapor-grown carbon fibers and a sulfur-containing curative.

21. The method of claim 14, wherein crosslinking the at least one crosslinkable polymer to form a cured elastomeric insulating material comprises crosslinking the at least one crosslinkable polymer to form a cured elastomeric insulating material formulated to have a volume resistivity between about 5×10^{9} and 5×10^{14} Ohms·cm.

22. The method of claim 14, wherein crosslinking the at least one crosslinkable polymer to form a cured elastomeric insulating material comprises crosslinking the at least one crosslinkable polymer to form a cured elastomeric insulating material having a perpendicular and a parallel elongation of greater than 30%, a parallel tensile strength of greater than 1000 psi, and a tear resistance of greater than 170 pli.

23. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer is performed under substantially solvent-free conditions.

24. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer is performed in the absence of an organic solvent.

25. The method of claim 14, wherein dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer comprises substantially homogeneously dispersing the vapor-grown carbon fibers in the at least one crosslinkable polymer.